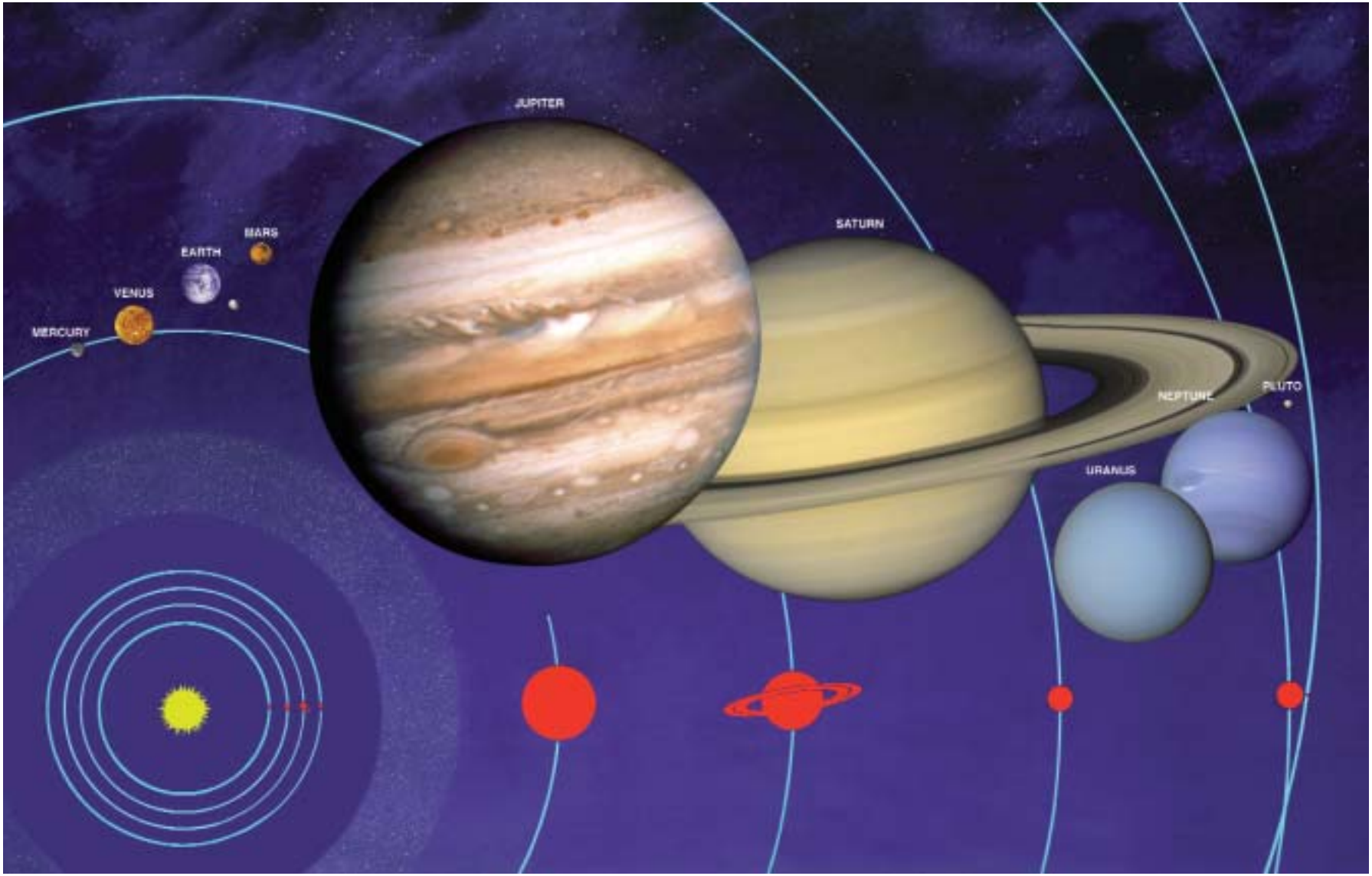
National Aeronautics and
Space Administration

Our Solar System



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From our small world we have gazed upon the cosmic ocean for thousands of years. Ancient astronomers observed points of light that appeared to move among the stars. They called these objects planets, meaning wanderers, and named them after Roman deities—Jupiter, king of the gods; Mars, the god of war; Mercury, messenger of the gods; Venus, the goddess of love and beauty; and Saturn, father of Jupiter and god of agriculture. The stargazers also observed comets with sparkling tails, and meteors or shooting stars apparently falling from the sky.

Since the invention of the telescope, three more planets have been discovered in our solar system: Uranus (1781), Neptune (1846), and Pluto (1930). In addition, there are thousands of small bodies such as asteroids and comets. Most of the asteroids orbit in a region between the orbits of Mars and Jupiter, while the home of comets lies far beyond the orbit of Pluto, in the Oort Cloud.

The four planets closest to the Sun—Mercury, Venus, Earth, and Mars—are called the *terrestrial planets* because they have solid rocky surfaces. The four large planets beyond the orbit of Mars—Jupiter, Saturn, Uranus, and Neptune—are called gas giants. Tiny, distant Pluto has a solid but icier surface than the terrestrial planets.

Nearly all of the planets—and some of the moons—have atmospheres. Earth's atmosphere is primarily nitrogen and oxygen. Venus has a thick atmosphere of carbon dioxide, with traces of poisonous gases such as sulfur dioxide. Mars' carbon dioxide atmosphere is extremely thin. Jupiter, Saturn, Uranus, and Neptune are primarily hydrogen and helium. When Pluto is near the Sun, it has a thin atmosphere, but when Pluto travels to the outer regions of its orbit, the atmosphere freezes and "collapses" to the planet's surface. In this regard, Pluto acts like a comet.

There are at least 91 natural satellites (also called moons) around the various planets in our solar system, ranging from bodies larger than our own Moon down to small pieces of debris. Many of these were discovered by planetary spacecraft. Some of these have atmospheres (Saturn's Titan); some even have magnetic fields (Jupiter's Ganymede). Jupiter's moon Io is the most volcanically active body in the solar system. An ocean may lie beneath the frozen crust of Jupiter's moon Europa, while images of Jupiter's moon Ganymede show historical motion of icy crustal plates. Some planetary moons, such as Phoebe at Saturn, may be asteroids that were captured by a planet's gravity.

From 1610 to 1977, Saturn was thought to be the only planet with rings. We now know that Jupiter, Uranus, and Neptune also have ring systems, although Saturn's is by far the largest. Particles in these ring systems range in size from dust to boulders to house-sized, and they may be rocky and/or icy.

Most of the planets also have magnetic fields, which extend into space and form a "magnetosphere" around each planet. These magnetospheres rotate with the planet, sweeping charged particles with them. The Sun has a magnetic field, the heliosphere, which envelops our entire solar system.

Ancient astronomers believed that the Earth was the center of the universe and that the Sun and all the other stars revolved around the Earth. Copernicus proved that Earth and the other planets in our solar system orbit our Sun. Little by little, we are charting the universe, and obvious questions arise: Are there other planets around other stars? Are there other planets where life might exist? Only recently have astronomers had the tools to indirectly detect large planets around other stars in nearby galaxies. Direct detection and characterization of such planets awaits the development of yet more powerful observing tools and techniques.

The illustration on the reverse side is an artistic representation of the planets' sizes and distances.

Activities

How big is our solar system? To give you a rough idea, consider that it took the *Voyager 2* spacecraft, traveling in a sweeping arc at an average of 65,000 kilometers per hour, 12 years to reach Neptune! How fast is that in meters per second? In feet per second? If you could travel that fast, how long would it take you to reach the next town? To get to the Moon?

Can you build a scale model of the solar system? If you use Earth's diameter as a unit of measure (Earth diameter = 1), figure out how big the other planets are compared to Earth. Hint: divide each planet's diameter by Earth's diameter. What objects might you use to depict the sizes of the Sun and planets? How far away would the planets be from each other? Map out a scale model of the solar system in your town.

	Actual Diameter (km)	Mean Distance from sun (km)	Number of Moons
Sun	1,391,900	0	–
Mercury	4,878	57,910,000	0
Venus	12,104	108,200,0000	0
Earth	12,756	149,600,0001	1
Moon	3,476		–
Mars	6,794	227,940,000	2
Jupiter	142,984	778,330,000	28
Saturn	120,536	1,429,400,000	30
Uranus	51,118	2,870,990,000	21
Neptune	49,528	4,504,300,000	8
Pluto	2,300	5,913,520,000	1

References

1) Views of the Solar System—Solar System: *http://www.solarviews.com*
2) Planetary Photo Journal: *http://photojournal.jpl.nasa.gov*
3) Stardate: *http://stardate.org*

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